12.5I: Vestibulocochlear (VIII) Nerve

The vestibulocochlear nerve (cranial nerve VIII) carries information about hearing and balance.

LEARNING OBJECTIVES

Describe the vestibulocochlear nerve (cranial nerve VIII)

KEY TAKEAWAYS

Key Points

- The vestibulocochlear nerve comprises the cochlear nerve that transmits hearing information, and the vestibular nerve that transmits balance information.
- The cochlear nerve travels away from the cochlea of the inner ear where it starts as the spiral ganglia.
- The vestibular nerve travels from the vestibular system of the inner ear.

Key Terms

- **cochlear nerve**: A sensory nerve that conducts information about the environment to the brain, in this case acoustic energy impinging on the tympanic membrane (sound waves reaching the ear drum). The cochlear nerve arises from within the cochlea and extends to the brainstem where its fibers make contact with the cochlear nucleus, the next stage of neural processing in the auditory system.
- **vestibulocochlear nerve**: Also known as the auditory vestibular nerve, this is the eighth of twelve cranial nerves, and it is responsible for transmitting sound and equilibrium (balance) information from the inner ear to the brain.
- **vestibular nerve**: One of the two branches of the vestibulocochlear nerve (the cochlear nerve being the other). It connects to the semicircular canals via the vestibular ganglion and receives positional information.
The vestibulocochlear nerve (also known as the auditory vestibular nerve and cranial nerve VIII) has axons that carry the modalities of hearing and equilibrium.

It consists of the cochlear nerve that carries information about hearing, and the vestibular nerve that carries information about balance.

This is the nerve along which the sensory cells (the hair cells) of the inner ear transmit information to the brain. It emerges from the pons and exits the inner skull via the internal acoustic meatus (or internal auditory meatus) in the temporal bone.

**Vestibular system's semicircular canal**: An illustration of the inner ear showing its semicircular canal, hair cells, ampulla, cupula, vestibular nerve, and fluid.

The vestibulocochlear nerve consists mostly of bipolar neurons and splits into two large divisions: the cochlear nerve and the vestibular nerve. The cochlear nerve travels away from the cochlea of the inner ear where it starts as the spiral ganglia.

Processes from the organ of Corti (the receptor organ for hearing) conduct afferent transmission to the spiral ganglia. It is the inner hair cells of the organ of Corti that are responsible for activating the afferent receptors in response to pressure waves reaching the basilar membrane through the transduction of sound.

The vestibular nerve travels from the vestibular system of the inner ear. The vestibular ganglion houses the cell bodies of the bipolar neurons and extends processes to five sensory organs.

Three of these are the cristae, located in the ampullae of the semicircular canals. Hair cells of the cristae activate afferent receptors in response to rotational acceleration.

The other two sensory organs supplied by the vestibular neurons are the maculae of the saccule and utricle. Hair cells of the maculae activate afferent receptors in response to linear acceleration.
The vestibulocochlear nerve has axons that carry the modalities of hearing and equilibrium. Damage to the vestibulocochlear nerve may cause hearing loss, vertigo, a false sense of motion, loss of equilibrium in dark places, nystagmus, motion sickness, and gaze-evoked tinnitus.

A benign primary intracranial tumor of vestibulocochlear nerve is called a vestibular schwannoma (also called acoustic neuroma).